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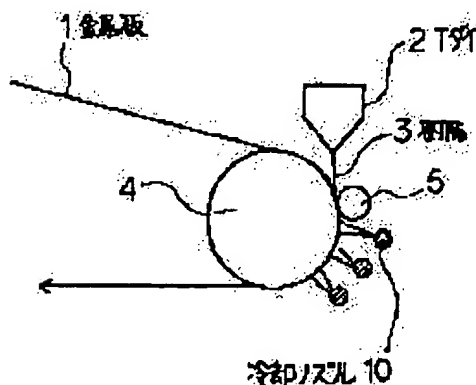
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## (54) MANUFACTURE OF LAMINATED METAL PLATE



(57)Abstract:

PURPOSE: To manufacture a thermoplastic resin metal plate in which adhesive properties, processibility, corrosion resistance and external appearance are improved and which has high yield by covering an entire width of the plate at a lateral center of a thermoplastic resin film, and injecting and cooling cooling medium to a surface of the film of a part overcoated with resin.

CONSTITUTION: A laminated metal plate is manufactured by the steps of bringing a press-bonding roll 5 into contact with M plate 1 wound on a winding roll 4 and preheated, feeding a thermoplastic resin film 3 melted by a T die 2 through an extruder to a gap between the roll 5 and the plate 1 and covering the plate 1 with the film. In this case, a width of the film 3 fed down to the gap between the roll 5 and the plate 1 is set larger than that of the plate 1. An entire width of the plate 1 is covered at a lateral center of the film 3. Simultaneously, cooling medium is injected

from a cooling nozzle 10 to the surface of the film 3 of a part overcoated with the resin to cool it.

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## MEANS

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[Means for Solving the Problem] this invention to namely, the preheated metal plate which was twisted around the roll with (1) volume In the method of carrying out the pressure welding of the sticking-by-pressure roll, flowing down the thermoplastics film fused from the T die through the extruder in the gap of a sticking-by-pressure roll and a metal plate, covering thermoplastics to a metal plate, and manufacturing a lamination metal plate While making larger than the width of face of a metal plate width of face of the thermoplastics film which flows down in the gap of a sticking-by-pressure roll and a metal plate, having it in the crosswise center section of the thermoplastics film and covering full [ of a metal plate ] The manufacture method of the lamination metal plate characterized by for a resin injecting a cooling medium on the front face of the thermoplastics film of the portion by which the overcoat was carried out, and cooling on it, [0020] (2) Carry out the pressure welding of the sticking-by-pressure roll to the preheated metal plate which was twisted around the roll with a volume. In the method of flowing down the thermoplastics film fused from the T die through the extruder in the gap of a sticking-by-pressure roll and a metal plate, covering thermoplastics to a metal plate, and manufacturing a lamination metal plate While making larger than the width of face of a metal plate width of face of the thermoplastics film which flows down in the gap of a sticking-by-pressure roll and a metal plate, having it in the crosswise center section of the thermoplastics film and covering full [ of a metal plate ] The manufacture method of the lamination metal plate characterized by for a resin carrying out the pressure welding of the cooling roller to the front face of the thermoplastics film of the portion by which the overcoat was carried out, and cooling on it, [0021] (3) Carry out the pressure welding of the sticking-by-pressure roll to the preheated metal plate which was twisted around the roll with a volume. In the method of flowing down the thermoplastics film fused from the T die through the extruder in the gap of a sticking-by-pressure roll and a metal plate, covering thermoplastics to a metal plate, and manufacturing a lamination metal plate While making larger than the width of face of a metal plate width of face of the

thermoplastics film which flows down in the gap of a sticking-by-pressure roll and a metal plate, having it in the crosswise center section of the thermoplastics film and covering full [ of a metal plate ] The manufacture method of the lamination metal plate characterized by reaching [ whether a resin carries out the pressure welding of the cooling roller for the crosswise both ends of the roll with a volume of a portion by which an overcoat is carried out, and ], or injecting a cooling medium, and cooling beforehand, [0022] (4) Carry out the pressure welding of the sticking-by-pressure roll to the preheated metal plate which was twisted around the roll with a volume. In the method of flowing down the thermoplastics film fused from the T die through the extruder in the gap of a sticking-by-pressure roll and a metal plate, covering thermoplastics to a metal plate, and manufacturing a lamination metal plate While making larger than the width of face of a metal plate width of face of the thermoplastics film which flows down in the gap of a sticking-by-pressure roll and a metal plate, having it in the crosswise center section of the thermoplastics film and covering full [ of a metal plate ] While reaching [ whether a resin carries out the pressure welding of the cooling roller for the crosswise both ends of the roll with a volume of a portion by which an overcoat is carried out, and ], or injecting a cooling medium and cooling beforehand The manufacture method of the lamination metal plate characterized by reaching [ whether the pressure welding of the cooling roller is carried out, and ] the front face of the thermoplastics film of a portion with which the overcoat of the resin was carried out, or injecting a cooling medium on it, and cooling on it, [0023] (5) the method of (1), (2), (3), and (4) publications which are characterized by preparing puncturing near [ where an overcoat resin contacts ] the roll surface portion with a volume -- come out

[0024] Hereafter, this invention is explained in detail, referring to a drawing.

[0025] In this invention, a thick steel plate and a thick galvanized steel sheet, the zinc-alloy plating steel plate, a tin plated steel plate, a tin-alloy plating steel plate, an aluminum plating steel plate, an aluminium alloy plating steel plate, or a stainless steel board of board thickness etc. is first used as a metal substrate from the use used for building materials, such as a roof, a wall, and a partition, the charge of automobile material, the material of a home electrical-and-electric-equipment product, furniture, a can, etc.

[0026] Furthermore, what has an about 0.1-5micro chemical-conversion layer on this is contained.

[0027] In order that a chemical conversion may raise the corrosion resistance of a metal substrate, oxidation resistance, and adhesion, it is performed as surface treatment of a metal plate, and is performed by phosphoric-acid zinc processing, phosphoric-acid iron processing, or the electrolytic chromate treatment.

[0028] Furthermore, after not performing a chemical conversion or performing a chemical conversion, what has an adhesives layer on this is contained.

[0029] An adhesives layer is a layer which applied about several [ at least ]micro adhesives, in order to improve the adhesion of a metal substrate and thermoplastics.

[0030] As these adhesives, the adhesive thermoplastics which has functional groups, such as a denaturation polyethylene resin, a denaturation epoxy resin, and denaturation vinyl resin, is suitable.

[0031] Adhesion is good for the both sides of a metal and the thermoplastics used for covering, for example, in the case of a polyolefine covering steel plate, a denaturation polyolefine like an ethylene-vinyl acetate copolymerization resin or an ethylene-acrylic-acid copolymerization resin is suitable for these.

[0032] The thermoplastics used for covering by this invention For example, a polyethylene-terephthalate resin, Polyolefin resin, acrylic resin, polyester resin, polyamide resin, Vinyl chloride resin, a fluororesin, polycarbonate resin, a polystyrene system resin, ABS plastics, a chlorinated-polyether resin, a urethane resin, etc. are typical. to polyolefin resin There are a polymer or copolymers, such as ethylene, a propylene, 1-butene, and 1-pentene. as acrylic

resin There are a polymer or copolymers, such as an acrylic acid, a methacrylic acid, an acrylic ester, methacrylic-acid ester, and an acrylamide. to polyester resin There are a polyethylene terephthalate, oil free polyester, etc. to polyamide resin There are the so-called Nylon 66, nylon 6, Nylon 610, Nylon 11, etc. to vinyl chloride resin There is a copolymer with vinyl acetate, others, for example, ethylene, etc., and there are a polytetrafluoroethylene, a 3 \*\*\*\*-ized ethylene chloride resin, a 6 \*\*\*\*-ized ethylene propylene resin, \*\*\*\*-ized vinyl resin, \*\*\*\*-ized vinylidene resin, etc. in a fluoro-resin. [ homopolymer ]

[0033] Moreover, you may mix and use two or more resins. Moreover, the additive usually used at the time of film creation, for example, a degradation inhibitor, the modifier, the pigment, etc. may be included.

[0034] Moreover, in case it covers with a melting state, you may add cross linking agents, such as amino resin and an epoxy resin, in the range which does not lose a fluidity.

[0035] These thermoplastics is suitably chosen according to needs, such as weatherability, cold district fitness, thermal resistance, scratch-proof nature, resistance to contamination, chemicals-proof nature, and deep-drawing processability, according to the use of a surface treatment metal plate. For example, a polyolefine is excellent in cold resistance, a polyamide is excellent in abrasion resistance, acrylic resin is excellent in resistance to contamination or chemicals-proof nature, and it is excellent [ a fluoro-resin ] in weatherability etc.

[0036] The polyethylene-terephthalate resin is especially useful for an acid-proof use.

[0037] Multilayer covering of that monolayer covering is also of the same kind or a different-species resin is sufficient as a resin. In multilayer covering (for example, a multilayer T die), it can carry out, and a glue line can also be prepared between layers.

[0038] At an interlayer thermoplastics in the upper layer for an adhesive resin to a lower layer for example, by the three-layer T die [ the steel plate which is applying and preheating adhesives ] [ the thermoplastics in a melting state ] It can extrude in the shape of a film, and the surface treated steel sheet which carried out multilayer covering directly and continuously can be obtained. Or thermoplastics can be obtained in the 1st lower layer and the surface treated steel sheet which extruded thermoplastics in the shape of a film by the four-layer T die in the 4th best layer at the 3rd interlayer, and carried out multilayer covering of the adhesive resin directly and continuously can be obtained for the adhesive resin which is in the steel plate which is preheating at a melting state to the 2nd interlayer.

[0039] A drawing explains a manufacturing process below.

[0040] A metal substrate needs to precede covering a melting resin and it is necessary to preheat it.

[0041] For example, in the case of a polyethylene terephthalate, the preheating of -120 degrees C or more (therefore, about 135-255 degrees C) of melting points (255 degrees C) is desirable.

[0042] By carrying out a preheating, the fluidity of a resin increases and adhesion improves.

[0043] When not performing a preheating, or when preheat temperature is low and a cooling roller is especially used, the adhesion of a resin is not enough and a result which lacks in corrosion resistance is brought.

[0044] Although the temperature of a preheating is so desirable that it is high since the fluidity of a resin increases, since a resin and adhesives will decompose if too high, it is not desirable. Moreover, it is not desirable from a viewpoint of energy saving.

[0045] Therefore, it is preferably carried out below the temperature of a melting resin by temperature lower 50 degrees C or more than the temperature of a melting resin, and the preheat temperature of about 50-230 degrees C of usual.

[0046] Drawing 1 carries out the pressure welding of the sticking-by-pressure roll 5 to the front face of the metal substrate 1 which twisted and was twisted around the roll 4 and which it preheated, flows down the thermoplastics film 3 fused from T die 2 through the extruder to the interface of the metal substrate front face and sticking-by-pressure roll 5, and shows the

lamination metal plate manufacture method of \*\*\*\*\* (ing) a thermoplastics film to the metal substrate 1.

[0047] Regulation of film \*\* or a surface state is easy for this method. For example, it is also easy regulation of surface gloss and to give an embossing pattern to a front face.

[0048] As for the metal substrate 1 with which the elevated-temperature melting resin 3 was covered, cooling \*\*\*\*\* is performed. Even if cooling may perform a water spray for example, after air cooling and it makes it pass through a water-cooled tub, you may let a cooling roller pass.

[0049] Thus, although the surface treatment metal plate of this invention is obtained In this invention, the resin which carried out the overcoat is sprayed in a cooling medium. Or a cooling medium is injected and it cools beforehand. or -- or it carries out the pressure welding of the cooling roller or a resin carries out the pressure welding of the cooling roller for the crosswise both ends of the roll with a volume of a portion by which an overcoat is carried out -- and -- It is made easy to promote cooling and solidification of a resin, to reduce the adhesion force of a roll front face with a volume, and an overcoat resin, and to exfoliate from a roll with a volume by using together these two or more methods.

[0050] If the temperature of a resin is high, it is sticky, it attaches and is easy to adhere to a roll with a volume, and since the resin itself is soft, it will be torn off and will coil around a roll with a volume.

[0051] Moreover, it is made easy to reduce the adhesion force with a resin, and to promote cooling and solidification of a resin, although it is indirect, and to exfoliate from a roll with a volume by lowering the temperature of a roll front face with a volume.

[0052] Next, a drawing explains this.

[0053] Drawing 2 is explanatory drawing explaining the case where inject a cooling medium on the front face of the thermoplastics film 3, and it cools through a cooled nozzle 10 on it. It may replace with a cooled nozzle or a cooling roller may be used simultaneously.

[0054] As a cooling medium, \*\*\*\* (the shape of a fog), liquid nitrogen, etc. which air mixed with air, water, and water are suitable from economical efficiency or refrigeration capacity.

[0055] Moreover, a screen 9 is formed in the edge of a metal plate, and you may make it a cooling medium not start a metal plate, as shown in drawing 3 , so that the metal plate itself may not be cooled.

[0056] By the cooled nozzle 10, drawing 4 shows the example for which drawing 5 has cooled the crosswise both ends of a roll with a volume by the cooling roller 11, respectively.

[0057] In addition, the roll with a volume has a product made from Teflon, or a desirable product made from silicon, in order to weaken the adhesion of a resin.

[0058] Moreover, as a cooling roller, a point to the copper or iron of the cooling effect is suitable.

[0059] An example explains below.

## EXAMPLE

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[Example] After preheating this steel plate at 200 degrees C by the thickness of 0.2mm using the lamination metal plate manufacturing installation which used the roll with a volume with an outer diameter of 450mm, and the nip roll (sticking-by-pressure roll) with an outer diameter of 200mm, using a surface treated steel sheet with a width of face of 800mm as a metal plate, melting extrusion flowing down of the polyethylene-terephthalate resin was carried out from the T die through the extruder at the interface of the above-mentioned steel plate front face and the above-mentioned nip roll.

[0061] The temperature of a melting resin is 280 degrees C, covering thickness is 50 micrometers, covering width of face is 860mm, it covers more widely 30mm of both sides at a time than a steel plate, and line speed is 20 m/min, and the angle which twists a steel plate

around a roll with a volume is 90 degrees after a pressure welding.

[0062] (1) Air was sprayed until it used the air jet hole for the front face of the resin which carried out the overcoat after the pressure welding and carried out the steel plate coiling-round end.

[0063] Without adhering to a roll with a volume, it was stabilized and the overcoat resin has been operated. At this time, the screen was prepared in the edge of a steel plate so that a cooling medium might not start a steel plate side.

[0064] (2) The cooling roller of a method which uses an air jet hole for a roll front face with a volume, and sprays air, and pours water to the copper interior with an outer diameter of 50mm by width of face of 30mm was contacted on the front face, and the roll front face with a volume was cooled.

[0065] Without adhering to a roll with a volume, it was stabilized and the overcoat resin has been operated.

[0066] (3) Above (1) and (2) were compounded and carried out. this case -- satisfactory -- it can operate -- further -- more -- high speed -- line speed -- also raising (about 40 m/min) -- it has operated good

[0067] Moreover, when [condition of (3)] operation was performed like the above near [ where the resin which disturbed contacts ] the roll surface portion using the roll with a volume which prepared puncturing rather than the steel plate as shown in drawing 6 , line speed was gathered at still high speed, and at least about 50 m/min has operated good.

[0068] When it operated without cooling in the above-mentioned example as an example of comparison, the resin protruded from the metal plate coiled around the roll with a volume which has twisted the metal plate immediately, and became operation impotentia on it.

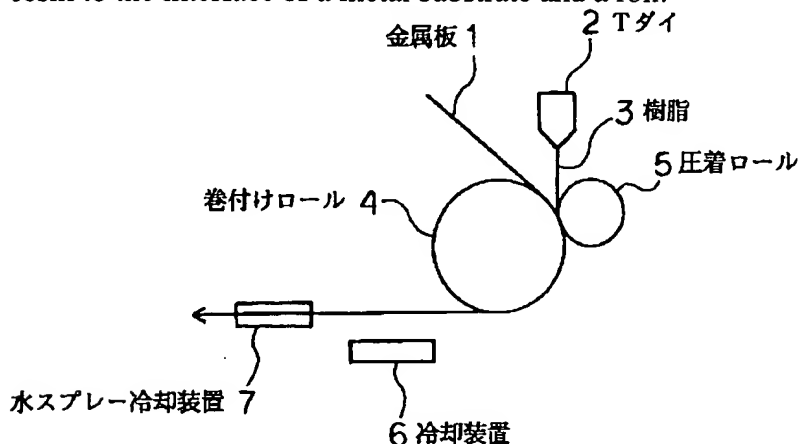
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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is explanatory drawing of the method of covering by flowing down a melting resin to the interface of a metal substrate and a roll.



[Drawing 2] Explanatory drawing of the example which cools a resin side by the cooled nozzle.